

## **Robotics - Diane Stinger**

### **Narrative description of how my use of technology in the classroom has impacted student performance.**

This year gifted and talented students in the robotics class have performed many activities that improve performance. Writing about technology, lively discussions about technology, team building, problem solving, use of higher level thinking skills, inquiry based lessons, calculating measurements, and using math and science.

Daily activities need to be understood, analyzed and then solved by the students. Teammates use reasoning skills to make decisions about what is needed for the robots to complete missions. An example of decision-making is student teams deciding whether to use wheels or treads on their robot. Students work through scenarios using higher level thinking skills such as analysis, prediction, and application. Trial and error is an everyday occurrence with robot building.

The computer programming increases computer skills, math, and measurement. During programming lively discussions are common in decisions to solve problems such as which sensors work the best. The daily challenges are inquiry-based, the students use hands-on, real life models to perform exact tasks. Interaction between students makes this project dynamic, always changing. As the students walk in the door of the classroom they are telling one another how they thought of solutions to problems last night or in the shower or when they talked it over with parents. Engagement of all students is the rule not the exception with this project.

Research about the Earth's oceans is undertaken along with building robotics. Each student must choose an ocean or sea activity and trace its impact in terms of the oceans' health, biodiversity, and productivity. A learning poster is created and presented to judges at the competition. This project improves student's performance in research, writing, predicting and concluding. Students also practice their speaking skills.

One day a math teacher came to see what we were doing in class. One of my students grabbed her and showed her how he was using math he had learned in her class to figure out some programming problems. The teacher was very impressed and he was proud of his accomplishments using his math knowledge. Another day the students were having fits trying to figure out rotation sensors on the robot. They wanted the robot to turn without stopping and they were using positive and negative numbers and finally solved it by using two negatives that produced a positive.... they were delighted to have come up with a solution.

Students are expected to write in a journal daily about their successes and failures and reflect about these. Students create a tri-fold presentation board of their accomplishments, noting strengths and weaknesses for analysis and conclusions. The day of the competition each team will present their accomplishments to judges, answer questions about why they did what they did and put their robot to the test against other students from southeastern Idaho.

Working in a team is a performance objective that will help students do well in the real world. Sometimes bright students don't want to share their ideas and work with others, but with this robotics project students are bursting with ideas to share and want to pitch in on the work that must be done to complete the challenges.

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### **Narrative description of how what I am proposing to purchase will enable me to use technology in an innovative manner to enhance learning opportunities for my students**

I propose to purchase a Robotics Educator Start-Up Pack with everything we will need to get started with the new and exciting challenges. The materials I am proposing to purchase with this grant include all the components needed for three teams.

- Two software options: Robotics Invention System 2.0 and Robolab 2.5; both are single user licenses
- Exclusive collect of several hundred LEGO ELEMENTS
- 3 RCX microcomputer
- 1 USB Tower
- 9 gear motors
- 6 light sensors
- 6 touch sensors
- 3 rotation sensors
- 1 Lego Lamp
- 3 Constructopedia - with building instructions for sample robots
- 4' x 8' roll-out field mat
- 3M Dual Lock fasteners
- 2 laptop computers for programming robots

A competition table is necessary to practice before the competition. Frame supplies must be purchased and then put together. A playing field would need to fit the 4' x 8' field mat with a border around it and this frame can also be used from year to year.

Using this challenging and highly engaging project to attract both boys and girls' interests will use the above technology in an innovative manner. The technology is designed for middle school ages (9-14 year olds.) Students at my school this year are already talking about joining a team to compete for next year. I meet daily with my gifted and talented students for almost an hour. This project will thoroughly engage students for 8 to 10 weeks.

The teams can have up to ten students but I have found that 4-5 work much better and encourages a closely-knit team. These teams split into smaller groups for different tasks, such as strategy, programming, or the research project. This innovative technology program motivates students not predisposed to science, math, or technology. The program is able to effectively engage children from various backgrounds, instilling new ideas and concepts in more experienced students, while helping to inspire, motivate, and encourage learning basic principles and skills among students with less experience. Through this involvement students will also learn about important, life-long team skills such as planning, research, collaboration, mentorship, and teamwork.

This grant would allow students to use technology in an innovative way. Students will be engaged in a competitive, team-based program that works with LEGO Mindstorms. Students build LEGO robots that are programmed through a computer to perform skills. At the competition, the Robots have two minutes and thirty seconds to complete missions on a 4' x 8' playing mat. Teams earn points based on the robots performance in each of these challenges.

Students will spend up to eight weeks preparing for the competition. They start with a box of Legos and create a robot. They program the robot with a computer, creating programs to run their robot through several challenges on the competition mat. An example: The robot must service the Pipeline. To do this the robot must install the new segment of pipe so that the team can test the line. When the segment is installed, the team must use hand force at the east end to raise the yellow flags. The yellow flags raised are worth 40 points. The students work in teams and are responsible for roles in that team. Student roles include: program the computer, make attachments for the robot for different challenges, log the daily progress in a journal, and research the oceans to improve pollution problems and encourage biodiversity. Together they will prepare for culminating activity that is judged.

Team members interact with judges to explain robot design and programming approaches. Judges ask question to determine team member roles and individual understanding of the technical process. Team members are also judged on a presentation topic announced each year by the National FIRST organization.

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Students research and prepare a presentation to execute in front of a team of judges. Judges ask a variety of questions to determine their understanding of the research topic. Teams are also judged on their teamwork skills and interactions. Communication, respect, responsibility, and problem solving skills are part of this competition.

This project will provide opportunities for students in my classroom to work together and use technology to solve unusual and stimulating problems. The students will be engaged in math, science and technology education. I think the creativity, persistence, learned skills, and cooperation needed to complete the LEGO challenges will help participants become successful problem solvers today and in the future.

All students will be winners who participate because sportsmanship, cooperation, collaboration and risk-taking are valued as part of the problem solving experience. The full benefits of this project occur only when students can feel a sense of accomplishment from knowing that their competitive efforts come completely from their minds and hands. This feeling of empowerment and success is what this project is all about.

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Activity	Salaries Benefits	Contractual	Materials Agreements	Capital and Supplies	Objects
<b>TOTAL</b>					
Build Lego Robots, Program Robots					
• 3 Robotic Invention systems \$1200.00				\$1200.00	
• 2 Laptop Computers 2000.00					\$2000.00
• Challenge Table 300.00	\$200.00			300.00	
Competition					
• Registration			\$600.00		600.00
• Presentation Materials (trifold, markers etc.) 100.00				100.00	
• T-shirts, snacks 300.00				300.00	
<b>TOTAL</b>	<b>\$200.00</b>		<b>\$600.00</b>	<b>\$1900.00</b>	<b>\$2000.00</b>
					<b>\$47000</b>